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(54) System for deleting picture information.

(57) A system for deleting picture information is provided for a picture information file. The system has a keyboard (3), a 2-dimension scanning device (11), a magnetic tape device (17), a display device (13) and a control device (1) including a microprocessor (31). The deletion of the picture information recorded in the magnetic tape device (17) is performed by recording the delete mark in a delete mark recording area of the retrieval title corresponding to the picture information to be deleted.

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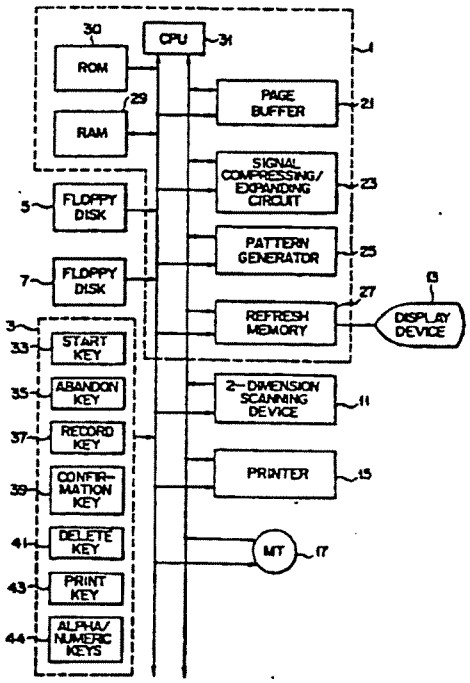
Croydon Printing Company Ltd.

FIG. 3


30
CPU
31
1
ROM
PAGE BUFFER
21
29
RAM
SIGNAL COMPRESSING/ EXPANDING CIRCUIT
23
5
FLOPPY DISK
PATTERN GENERATOR
25
7
FLOPPY DISK
13
27
REFRESH MEMORY
DISPLAY DEVICE
3
33
START KEY
35
ABANDON KEY
2-DIMENSION SCANNING DEVICE
11
37
RECORD KEY
39
CONFIR-MATION KEY
PRINTER
15
41
DELETE KEY
MT
17
43
PRINT KEY
44
ALPHA/ NUMERIC KEYS

System for deleting picture information

The present invention relates to a deleting system of picture information in a picture information file device which is capable of recording picture information such as a document and which is capable of retrieving and outputting the recorded picture information as needed.

A conventional system for storing and retrieving a document picture is known wherein pictures reduced in scale are directly recorded on microfilms. As an improvement over this system, a picture information file device has been proposed which uses a 2-dimension scanning device utilizing photoelectric conversion techniques with a laser beam or CCD elements. This 2-dimension scanning device decomposes a document picture into picture elements, converts the picture elements into picture signals, and records the picture signals on a magnetic recording medium at a high density. This type of device also stores on the magnetic recording medium picture information and a retrieval title consisting of a retrieval code indicating a recording position of the picture information and so on. Therefore, as the need arises, the retrieval code may be input to retrieve the corresponding document picture as a hard copy.

However, with this type of device, the retrieval title and picture information must be deleted in order to

delete the picture information recorded on a magnetic recording medium, resulting in inconvenience. Recording of new picture information in the deleted area also requires complex procedure.

It is an object of the present invention to provide a deleting system of picture information which eliminates the drawbacks of the conventional systems and which allows easy deletion of recorded picture information and recording of new picture information in place of the deleted picture information.

In order to achieve the above object, there is provided according to the present invention, a deleting system for variable length picture information in a picture information file device which stores picture information and a retrieval title including a retrieval code for retrieving the picture information, a track number and a block number, a recording area for recording the length of the picture information, and a delete mark representing that the picture information is deleted, and which outputs picture information corresponding to an input retrieval code, including:

(a) a control information input device comprising a keyboard having an abandon key for specifying abandonment of the picture information, a record key for specifying recording of the picture information, and a delete key for specifying deletion of the picture information;

(b) a 2-dimension scanning device which two-dimensionally scans the picture information for photoelectric conversion and outputs the photoelectrically converted picture information;

(c) a magnetic tape device for recording the photoelectrically converted picture information in an area represented by the track number and the block number on a magnetic tape;

(d) a display device for displaying picture information recorded or to be recorded by said magnetic

tape device; and

(e) a control device which has a programmable microprocessor connected to said control information input device, said 2-dimension scanning device, said magnetic tape device and said display device, and which includes a central processing unit for receiving input signals for controlling the recording, abandonment and deletion of the picture information, a read-only memory device for storing permanent programs, and a random access memory for storing data input by said control information input device, said read-only memory device storing the permanent programs having functions of said central processing unit so that said control device may perform specific functions according to the permanent programs;

wherein said control information input device, said 2-dimension scanning device, said display device and said magnetic tape device are so controlled that a delete mark is written in a delete mark recording area in the retrieval title for deleting the picture information recorded on the magnetic tape.

According to the present invention, a delete mark recording area is included in the retrieval title so that deletion of picture information may be performed by recording a delete mark in this delete mark recording area. Therefore, deletion of recorded picture information may be performed with ease, and new picture information may also be recorded in the deleted area with ease.

Other objects and features of the present invention will be apparent from the following description taken in connection with the accompanying drawings, in which:

Fig. 1 is a schematic view of a picture information file device to which the recording system of picture information according to the present invention is applied;

Fig. 2 is a block diagram showing an embodiment of the recording system of picture information of the

present invention;

Fig. 3 is a detailed block diagram showing a main control device and an input device shown in Fig. 2;

Fig. 4 is a view schematically showing a cassette tape of a magnetic tape device and a tape feed mechanism shown in Figs. 2 and 3;

Fig. 5 is a view showing the configuration of tracks of the cassette tape shown in Fig. 4;

Figs. 6A and 6B are views showing the recording formats of retrieval titles and picture information written in the tracks of the cassette tape shown in Fig. 5, wherein Fig. 6A shows the recording format of the retrieval titles and Fig. 6B shows the recording format of the picture information;

Figs. 7A and 7B are flow charts showing the control operation of the main control device for performing registering of picture information;

Fig. 8 is a flow chart showing the control operation of the main control device for performing retrieval and reproduction of the registered picture information;

Fig. 9 is a flow chart showing the control operation of the main control device for deleting the registered picture information; and

Figs. 10 to 12 show modifications of the embodiment of the present invention shown in Fig. 3, wherein Fig. 10 is a block diagram of a system which uses a magnetic disk device in place of a magnetic tape device shown in Fig. 3, Fig. 11 is a block diagram of a system which stores control programs in a floppy disk in place of a ROM, and Fig. 12 is a block diagram showing a system which stores the control programs in a floppy disk in place of the ROM and which uses a magnetic disk device in place of the magnetic tape device.

Fig. 1 is a schematic view of a picture information file device to which the recording system of picture information of the present invention is applied.

Referring to Fig. 1, when an original is set on an original table 2, the original is subjected to 2-dimensional scanning by a laser scanning system 4 for reading the picture information. The picture information is recorded on a magnetic tape 6. The picture information recorded on the magnetic tape 6 is retrieved according to a retrieval code input from a keyboard and displayed at a display device 8. If necessary, a hard copy 12 is prepared by an electro-photographic processing system 10.

Fig. 2 is a block diagram showing the configuration of a system for storing and retrieving picture information according to the present invention. According to input information from an input device 3 (for example, a keyboard), a main control device 1 performs editing processes such as recording, reproduction, addition, insertion, deletion and so on of picture information and retrieval titles; and controls devices connected to this main control device 1. First and second floppy disks 5 and 7 store application programs, and the main control device 1 performs control according to these application programs.

Picture information 9 such as a document is photo-electrically converted by 2-dimensional scanning by a 2-dimension scanning device 11. The photoelectrically converted picture information (video signal) is supplied through the main control device 1 to a display device 13 such as a CRT display, and a printer 15 or a magnetic tape device 17. The 2-dimension scanning device 11 includes a switch (not shown) for controlling the binary encoding level according to the density of the original. The display device 13 displays the retrieval title from the keyboard 3, and the picture information from the 2-dimension scanning device 11 or from the magnetic tape device 17. The printer 15 receives the picture information from the 2-dimension scanning device 11 or from the magnetic tape device 17 and forms

a 2-dimensional visible image, which is output as a hard copy 19.

Fig. 3 is a block diagram showing in detail the main control device and the input device shown in Fig. 2. The main control device 1 comprises a page buffer 21 for storing the picture information in units of pages, a signal compressing/expanding circuit 23 for performing signal compression and expansion by the MH (modified Hoffman) conversion or the MH inverse conversion, a pattern generator 25 for generating a character pattern, a refresh memory 27 for storing information to be displayed at the display device 13, a random access memory (RAM) 29 having a capacity sufficient to store the retrieval titles corresponding to one magnetic tape to be described later, and a central processing unit (CPU) 31 for controlling these circuits. An 8-bit microprocessor 8085 available from Intel. Corp., U.S.A. may be adopted as the CPU 31. A read-only memory (ROM) device 30 is externally connected to the CPU 13 and stores control programs to control the devices described above according to the registering mode, the retrieval mode, and the deletion mode of picture information.

The input device (keyboard) 3 includes a start key 33 which is depressed for storing a retrieval title or for setting the original, an abandon key 35 which is depressed for abandoning the picture information stored in the page buffer 21, a record key 37 which is depressed for recording the picture information stored in the page buffer 21 on a magnetic tape to be described later, a confirmation key 39 which is depressed when the picture information recorded on the magnetic tape is satisfactory, a delete key 41 which is depressed for deleting the picture information stored on the magnetic tape, a print key 43 which is depressed when the hard copy 19 of the picture information stored in the page buffer 21 is necessary, and alpha/numeric keys 44 for numerals 0 to 9 and for letters of the alphabet.

Fig. 4 is a schematic view showing a cassette tape and a feed mechanism of the magnetic tape device 17. Inside a casing 45 is disposed a stationary reel 47 which does not rotate and around which is wound magnetic tape 49 of, for example, 1/2 inch width (about 12.7 mm) and about 36 m length. When the cassette tape of this construction is mounted, the innermost turn of the tape is guided outside through a window 47a formed in the reel 47, is fed at high speed (about 5 m/sec) in the direction shown by arrow a in the figure by a capstan 51 and a pinch roller 53, and is then wound around the outermost turn of the tape 49. Therefore, the tape 49 completes one course in about 7.2 seconds. This one travel of the tape is confirmed by optically detecting at a mark detector 57 a tape mark 55 such as a silver paper chip attached to a connecting part 49a of the tape 49 as shown in Fig. 5. The output from the detector 57 is used as a reference for detecting a block position (to be described later) on the tape 49. Thus, 200 recording tracks 59 (of about 40 μm width and about 52 μm pitch) are formed parallel to each other along the direction of arrow a on the tape 49 as shown in Fig. 5. Track numbers "0, 1, 2,..., 198, 199" are sequentially assigned to the recording tracks 59 from the lowermost track. Two substantially central tracks (track numbers 99 and 100 of which track number 99 is auxiliary) define a recording track 59_1 which records an inherent retrieval title (consisting of the retrieval code and the recording address which, in turn, consists of the track number and the block number) corresponding to picture information of one unit; and the remaining 198 recording tracks (track numbers 0 to 98 and 101 to 199) define information recording tracks 59_2 for recording the picture information. Each recording track 59 is divided into 256 blocks in the longitudinal direction of the tape as shown in Fig. 5; each block is sequentially assigned block numbers "0, 1, 2,..., 254, 255"

starting from the tape mark 55. Recording and reproduction of information on the tape 49 is performed by selecting a desired recording track 59 by reciprocally moving, by a head access mechanism (not shown), a recording/reproducing head (2-gap magnetic head having the function of deletion) 61 disposed in the vicinity of the capstan 51 a certain distance in units of microns in a direction b perpendicular to the direction shown by the arrow a.

Fig. 6A shows the recording format of the respective retrieval titles on the retrieval title recording track 59_1. The retrieval titles are sequentially recorded in a retrieval code recording area 63 which records the retrieval code; a recording address recording area 65 which records recording addresses of a track number and a block number of the track which stores the picture information corresponding to this retrieval code; a length of picture information recording area 67 which records the length of the picture information, that is, how many blocks are involved in storing this picture information; and a delete mark recording area 69 which records a delete mark representing whether or not the picture information corresponding to the retrieval code is deleted. Fig. 6B shows the recording format of the picture information in the information recording track 59_2, wherein picture information 71 is recorded on a plurality of blocks.

Registration of the picture information with a picture information file device adopting the deleting system of picture information according to the present invention will be described with the flow charts shown in Figs. 7A and 7B. The flow charts shown in Figs. 7A and 7B show the control operation for registering the (k + 1)th section of picture information when k sections of picture information including deleted picture information are already registered on the magnetic tape 49.

The registering mode is first set from the keyboard 3. This may be accomplished by inputting "1" when, for example, the display device displays messages of "registering mode: 1", "retrieval mode: 2", and "deleting mode: 3". When the registering mode is set, the retrieval code of the picture information to be registered is input from the keyboard 3 in step 73, and in step 75, the start key 33 is depressed. Upon this operation, the CPU 31 performs, in step 77, checking of the input data such as checking of the number of digits, the kind of characters and so on according to the format of the retrieval code which is prepared in advance. The retrieval codes which are already registered are checked for double registration. If the retrieval code is the correct one, it is stored in the RAM 29. If the retrieval code is not the correct one, the program returns to step 73, and another retrieval code is input. In step 79, when the original is set by the operator for the 2-dimension scanning device 11 and, in step 81, the start key 33 is depressed, the CPU 31 operates the 2-dimension scanning device 11 and drives the magnetic tape 49. In step 83, the 2-dimension scanning device 11 performs 2-dimension scanning and photoelectric conversion of the picture information such as a document set in step 79. The line information which is photoelectrically converted is sequentially stored in the page buffer 21. When picture information corresponding to one page is stored in the page buffer 21, the picture information is stored in the refresh memory 27 and is displayed at the display device 13 in step 85.

In step 87, the operator checks on the display to determine if the original is set straight or bent, and if the density of the orignal matches with the binary encoding level of the 2-dimension scanning device 11. If the picture information is not satisfactory, the abandon key 35 is depressed. Then, the CPU 31 deletes the contents in the page buffer 21 and the refresh

memory 27. If the original is not set straight or bent, the original is reset. If the density is improper, the binary encoding level of the 2-dimension scanning device 11 is adjusted. The program returnes to step 79, the original is reset and the procedure as described above is performed again.

If the display on the display device 13 is satisfactory, the record key 37 is depressed in step 91. Then, in step 93, the CPU 31 band-compresses, at the signal compressing/expanding circuit 23 by the conventional MH (modified Hoffman) conversion, the picture information of one unit stored in the page buffer 21 one scanning line at a time. The compressed line information is stored again in the page buffer 21.

In step 95, the CPU 31 computes the length (block number) L_{k+1} of the compressed picture information which is stored in the page buffer 21. This may be accomplished by dividing the amount of the compressed picture information by the amount of the recording information in one block. In step 97 to follow, a counter i is set to "1". In step 99, it is sequentially checked to determine if the delete mark is attached to each of the retrieval titles in the RAM 29. If it is judged in step 101 that the ith retrieval title has the delete mark, the length Li of the deleted picture information is compared in step 103 with the length L_{k+1} of the new picture information to be registered. If it is judged in step 105 that the picture information to be registered is shorter than or equal to the deleted picture information, the CPU 31, in step 107, updates the old retrieval title in the RAM 29 to the retrieval title consisting of the retrieval code of the new picture information and deletes the delete mark. The CPU 31 initiates the travel of the magnetic tape 49 and moves the head to the corresponding information recording track 59_2. The CPU 31 thus records the compressed picture information stored in the page buffer 21 starting

from a predetermined block. If it is judged in step 105 that the deleted picture information is longer than or equal to the picture information to be registered, it is judged in step 109, whether the content of the counter i is k, that is, if the recorded retrieval titles have been checked to the last one. If it is judged that this checking has not been completed, the counter i is incremented in step 111 and the program returns to step 99. The CPU 31 then checks if the delete mark is attached to the next code in the RAM 29. If there is a retrieval title to which the delete mark is attached, the same operation as described above and the recording of the new picture information are performed.

If, in step 101, there is no retrieval title to which the delete mark is attached and, in step 109, the content of the counter i is k, that is, the retrieval titles are checked to the last one, the new picture information is recorded in the (k + 1)th picture information recording area.

The retrieval and reproduction of the picture information registered in this manner will now be described with reference to the flow chart shown in Fig. 8. The retrieval mode is set from the keyboard 3. In this embodiment, the retrieval mode is set by inputting "2" as was described earlier. When the retrieval mode is set, the retrieval code is first input in step 115. In step 117, the start key 33 is depressed. Then, the CPU 31 checks the input data such as the number of digits, the kind of characters and so on according to the format of the retrieval code which is prepared in advance. Since this checking procedure is the same as in step 77 described with reference to Fig. 7A, the description thereof will be omitted. When the correct retrieval code is input, the CPU 31 initiates in step 121, the travel of the magnetic tape 49 and moves the head 61 to the retrieval title recording

track 59_1 to start reproduction from this track. Then, all the reproduced retrieval titles, that is, the retrieval codes and the recording address representing the track numbers and the initiating blocking numbers of the corresponding picture information, are stored in the RAM 29. In step 123, the CPU 31 sequentially compares the retrieval codes of the retrieval titles stored in the RAM 29 with the input retrieval code. If, in step 125, there is no retrieval code which coincides with the input retrieval code, an error display is performed in step 127 indicating that retrieval is impossible and the retrieval operation is terminated. When there is a retrieval code which coincides with the input retrieval code, in step 129, the track number and the block number of the coincident retrieval code are retrieved from the retrieval title which is stored in the RAM 29. The CPU 31 moves the head 61 to the information recording track 59_2 corresponding to the track number thus obtained, reads the picture information at this track, and stores the picture information in the page buffer 21. Thereafter, in step 131, the picture information for one scanning line at a time is subjected to band compression by MH inverse conversion at the signal compressing/expanding circuit 23 to return it to the original picture information, and the picture information is stored in the page buffer 21. When all the reproduced picture information for one page is stored in the page buffer 21, the CPU 31 supplies in step 133, the picture information to the refresh memory 27 and displays it at the display device 13. When the operator judges that the picture information thus displayed is to be printed, the operator depresses the print key 43 in step 135. Then, the CPU 31 supplies the picture information stored in the page buffer 21 to the printer 15 which produces the hard copy 19 in step 137.

Hard copies 19 of the corresponding picture

information are obtained by the same operation when other retrieval codes are input.

Deletion of the picture information registered in this manner will now be described with reference to the flow chart shown in Fig. 9. First, the deletion mode is set from the keyboard 3. In this embodiment, the deletion mode is set by inputting "3" as has been described earlier. When the deletion mode is set, the retrieval code is first input in step 139. In step 141, the start key 33 is depressed. Then, the CPU 31 checks the input data as to the number of digits, the kind of characters and so on according to the format of the retrieval code which is prepared in advance. Since this checking procedure is the same as the checking procedure described with reference to step 77 of Fig. 7A, the description thereof will be omitted. When the correct retrieval code is input, the CPU 31 initiates in step 145, the travel of the magnetic tape 49 and moves the head 61 to the retrieval title recording track 59_1 to start reproducing the data on this track. Then, the length of the picture information (number of blocks), the delete mark, and all the reproduced retrieval titles, that is, the retrieval codes and the recording addresses representing the track numbers and the initiating block numbers of the corresponding picture information, are stored in the RAM 29. In step 147, the CPU 31 sequentially compares the retrieval codes of the retrieval titles stored in the RAM 29 with the input retrieval code. If it is judged in step 149 that there is no retrieval code coincident with the input retrieval code, an error display representing that retrieval is impossible is performed in step 151, and the retrieval operation is terminated. If the retrieval code coinciding with the input retrieval code is present, the track number and the block number assigned to this coicident retrieval code are retrieved from the retrieval title stored in the RAM 29 in step 153. The CPU 31

moves the head 61 to the information recording track 59_2 corresponding to the track number, reads the picture information of this track, and stores the picture information in the page buffer 21. Thereafter, in step 155, the picture information is subjected one scanning line at a time to band compression by MH inverse conversion at the signal compressing/expanding circuit 23, is converted into the original picture information, and is stored in the page buffer 21. When all the picture information corresponding to one page is stored in the page buffer 21, the CPU 31 supplies the picture information to the refresh memory 27 and displays it at the display device 13 in step 157. If the operator judges, in step 159, that the displayed picture information is to be deleted, the delete key 41 is depressed. Then, the CPU 31 records, in step 161, the delete mark in the delete mark recording area 69 of the corresponding retrieval title in the RAM 29. In this manner, the picture information whose delete mark corresponds with the recorded retrieval title is deleted.

In summary, in the recording area of the picture information whose delete code corresponds to the retrieval title assigned thereto may be recorded picture information of shorter length.

In the embodiment described above, the present invention has been described with reference to the case wherein picture information such as a document is recorded on or reproduced from a magnetic tape device in a picture information file device. However, the present invention is similarly applicable to a magnetic tape device which records or reproduces other kinds of information. Furthermore, the present invention has also been described with reference to the case of a magnetic tape device which uses an endless magnetic tape as the recording medium. However, the present invention may be similary applicable to other information recording devices such as a magnetic tape device which

uses a general magnetic tape and not an endless magnetic tape, a magnetic disk device which uses a magnetic disk as a recording medium of the picture information as shown at 163 in Fig. 10, or an optical disk device which uses an optical disk as the recording medium.

In the embodiment shown in Fig. 3, the control programs are stored in the read-only memory device 30. However, they may alternatively be stored on the floppy disks 5, 7 shown in Fig. 11. Still alternatively, a first floppy disk 5, 7 or a second floppy disk 165 may be incorporated as shown in Fig. 12. In this case, the first floppy disk 5, 7 may store the control programs and the second floppy disk 165 may store the picture information.

Claims:

1. A system for deleting picture information in a picture information file device which stores picture information and a retrieval title including a retrieval code for retrieving the picture information, a track number and a block number, a recording area for recording the length of the picture information, and a delete mark representing that the picture information is deleted, and which outputs picture information corresponding to an input retrieval code, including:

(a) a control information input device (3) comprising a keyboard having an abandon key (35) for specifying abandonment of the picture information, a record key (37) for specifying recording of the picture information, and a delete key (41) for specifying deletion of the picture information;

(b) a 2-dimension scanning device (11) which two-dimensionally scans the picture information for photo-electric conversion and outputs the photoelectrically converted picture information;

(c) a magnetic tape device (17) for recording the photoelectrically converted picture information in an area represented by the track number and the block number on a magnetic tape;

(d) a display device (13) for displaying picture information recorded or to be recorded by said magnetic tape device (17); and

(e) a control device (1) which has a programmable microprocessor connected to said control information input device (3), said 2-dimension scanning device (11), said magnetic tape device (17) and said display device (13), and which includes a central processing unit (31) for receiving input signals for controlling the recording, abandonment and deletion of the picture information, a read-only memory device (30) for storing permanent programs, and a random access memory (29) for

storing data input by said control information input device, said read-only memory device (30) storing the permanent programs having functions of said central processing unit (31) so that said control device (1) may perform specific functions according to the permanent programs, characterized in that said control device (1) is so designed as to control said control information input device (3), said 2-dimension scanning device (11), said display device (13) and said magnetic tape device (17) so that the deletion of the picture information recorded in the magnetic tape device (17) is performed by recording the delete mark in a delete mark recording area of the retrieval title corresponding to the picture information to be deleted.

2. A system for deleting picture information in a picture information file device which stores picture information and a retrieval title including a retrieval code for retrieving the picture information, a track number and a block number, a recording area for recording the length of the picture information, and a delete mark representing that the picture information is deleted, and which outputs picture information corresponding to an input retrieval code, including:

(a) a control information input device (3) comprising a keyboard having an abandon key (35) for specifying abandonment of the picture information, a record key (37) for specifying recording of the picture information, and a delete key (41) for specifying deletion of the picture information;

(b) a 2-dimension scanning device (11) which two-dimensionally scans the picture information for photo-electric conversion and outputs the photoelectrically converted picture information;

(c) a disk device (163) for recording the photoelectrically converted picture information in an area represented by the track number and the block number on a disk;

(d) a display device (13) for displaying picture information recorded or to be recorded by said disk device (163); and

(e) a control device (1) which has a programmable microprocessor connected to said control information input device (3), said 2-dimension scanning device (11), said disk device (163) and said display device (13), and which includes a central processing unit (31) for receiving input signals for controlling the recording, abandonment and deletion of the picture information, a read-only memory device (30) for storing permanent programs, and a random access memory (29) for storing data input by said control information input device (3), said read-only memory device (30) storing the permanent programs having functions of said central processing unit (31) so that said control device (1) may perform specific functions according to the permanent programs, characterized in that

said control device (1) is so designed as to control said control information input device (3), said 2-dimension scanning device (11), said display device and said disk device (163) so that the deletion of the picture information recorded in the disk device (163) is performed by recording the delete mark in a delete mark recording area of the retrieval title corresponding to the picture information to be deleted.

3. A system for deleting picture information in a picture information file device which stores picture information and a retrieval title including a retrieval code for retrieving the picture information, a track number and a block number, a recording area for recording the length of the picture information, and a delete mark representing that the picture information is deleted, and which outputs picture information corresponding to an input retrieval code, including:

(a) a control information input device (3) comprising a keyboard having an abandon key (35) for

specifying abandonment of the picture information, a record key (37) for specifying recording of the picture information, and a delete key (41) for specifying deletion of the picture information;

(b) a 2-dimension scanning device (11) which two-dimensionally scans the picture information for photo-electric conversion and outputs the photoelectrically converted picture information;

(c) a magnetic tape device (17) for recording the photoelectrically converted picture information in an area represented by the track number and the block number on a magnetic tape;

(d) a display device (13) for displaying picture information recorded or to be recorded by said magnetic tape device (17);

(e) a disk device (5, 7) storing permanent programs having functions of a central processing unit to be described later; and

(f) a control device (1) which has a programmable microprocessor connected to said control information input device (3), said 2-dimension scanning device (11), said magnetic tape device (17) and said display device (13), and which includes a central processing unit (31) for receiving control data for controlling the recording, abandonment and deletion of the picture information, and a random access memory (29) for storing data input by said control information input device (3), said disk device (17) storing the permanent programs having functions of said central processing unit (31) so that said control device (1) may perform specific functions according to the permanent programs stored in said disk device (5, 7), characterized in that

said control device (1) is so designed as to control said control information input device (3), said 2-dimension scanning device (11), said display device (13) and said magnetic tape device (17) so that the deletion

of the picture information recorded in said magnetic tape device (17) is performed by recording the delete mark in a delete mark recording area of the retrieval title corresponding to the picture information to be deleted.

4. A system for deleting picture information in a picture information file device which stores picture information and a retrieval title including a retrieval code for retrieving the picture information, a track number and a block number, a recording area for recording the length of the picture information, and a delete mark representing that the picture information is deleted, and which outputs picture information corresponding to an input retrieval code, including:

(a) a control information input device (3) comprising a keyboard having an abandon key (35) for specifying abandonment of the picture information, a record key (37) for specifying recording of the picture information, and a delete key (41) for specifying deletion of the picture information;

(b) a 2-dimension scanning device (11) which two-dimensionally scans the picture information for photo-electric conversion and outputs the photoelectrically converted picture information;

(c) a first disk device (165) for recording the photoelectrically converted picture information in an area represented by the track number and the block number on a disk of said first disk;

(d) a display device (13) for displaying picture information recorded or to be recorded by said first disk device;

(e) a second disk device (5, 7) for storing permanent programs having functions of a central processing unit to be described later; and

(f) a control device (1) which has a programmable microprocessor connected to said control information input device (3), said 2-dimension scanning device (11),

said first disk device (165) and said display device (13), and which includes a central processing unit (31) for receiving control data for controlling the recording, abandonment and deletion of the picture information, and a random access memory (29) for storing data input by said control information input device (3), said second disk device (5, 7) storing the permanent programs having functions of said central processing unit so that said control device (1) may perform specific functions according to the permanent programs stored in said second disk device (5, 7), characterized in that said control device (1) is so designed as to control said control information input device (3), said 2-dimension scanning device (11), said display device (13) and said first disk device (165) so that the deletion of the picture information recorded in said first disk device (165) is performed by recording the delete mark in a delete mark recording area of the retrieval title corresponding to the picture information to be deleted.

5. A system for deleting picture information according to claim 1, 2, 3 or 4, characterized in that a compandor (23) is further provided for performing compression and expansion of the picture information by modified Hoffman conversion or modified Hoffman inverse conversion.

6. A system for deleting picture information according to claim 1, 2, 3 or 4, characterized in that a printer (15) is further provided for producing a hard copy of the picture information displayed at said display device (13).

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FIG. 1

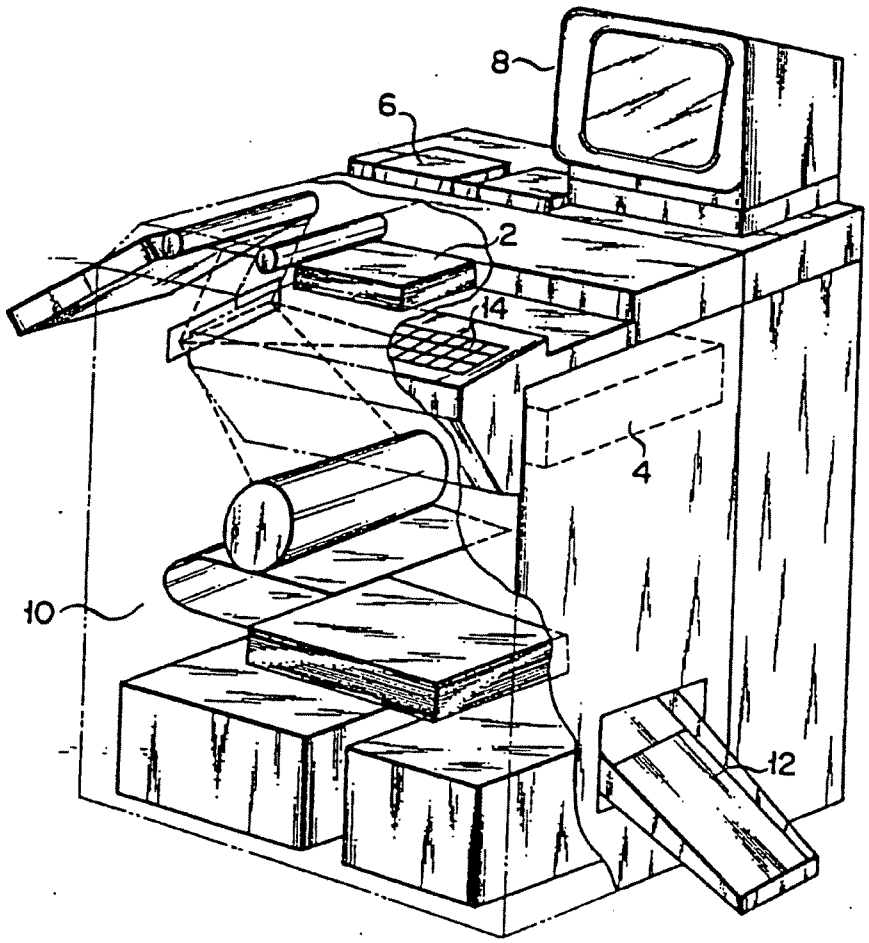


FIG. 2

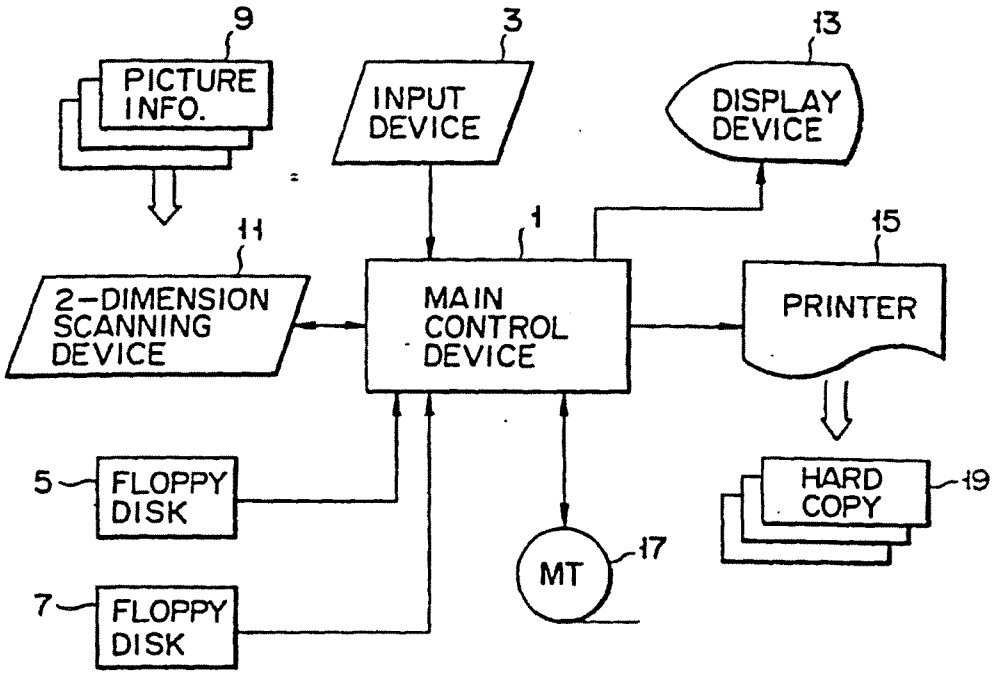


FIG. 4

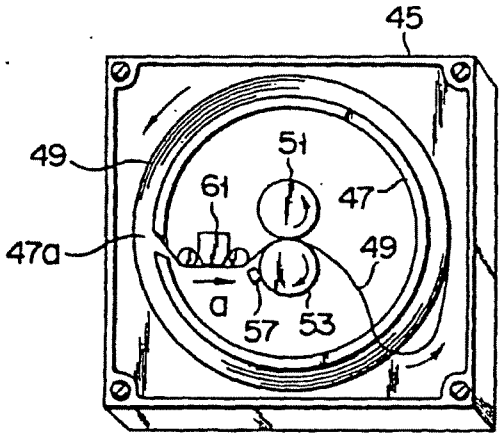


FIG. 3

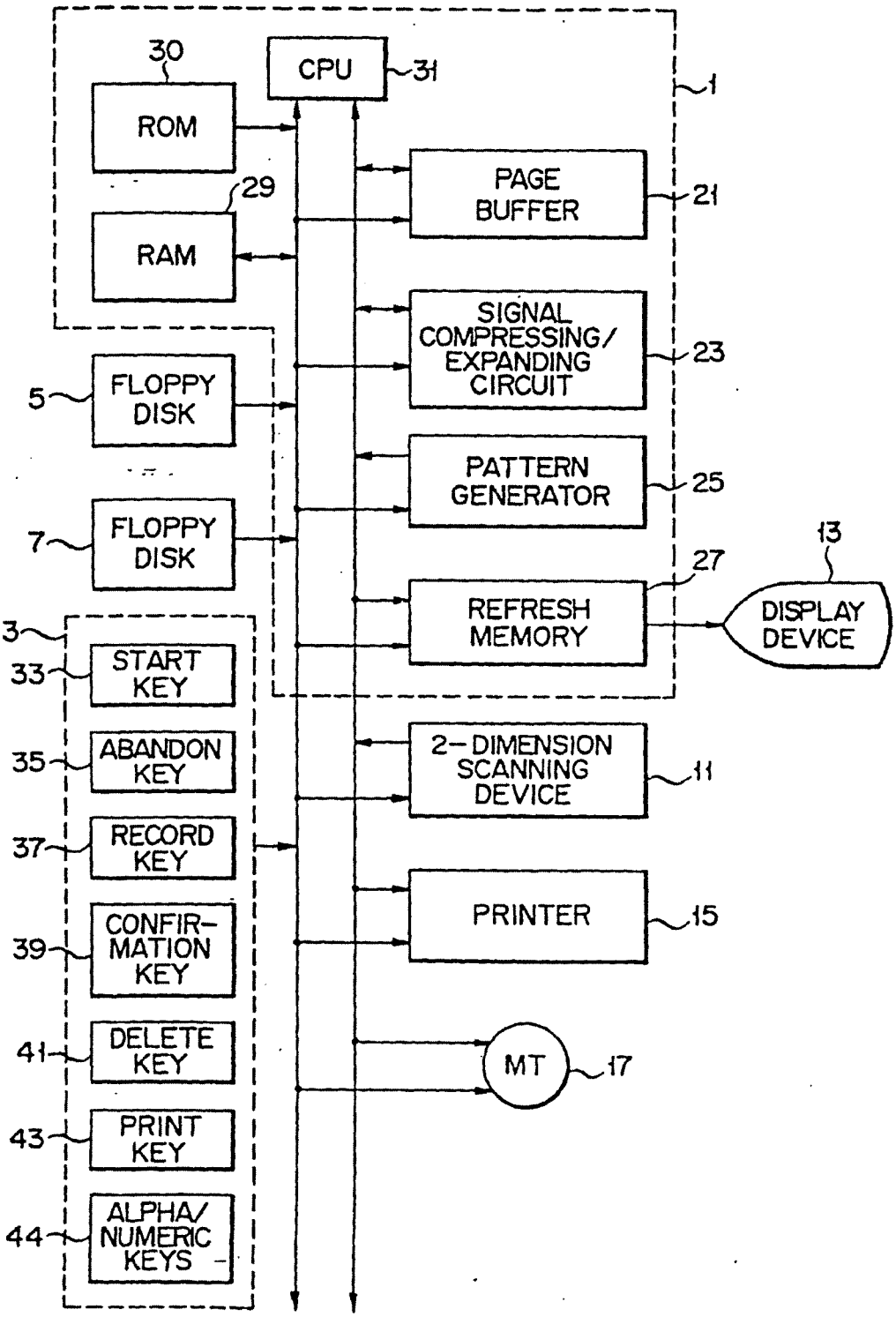


FIG. 5

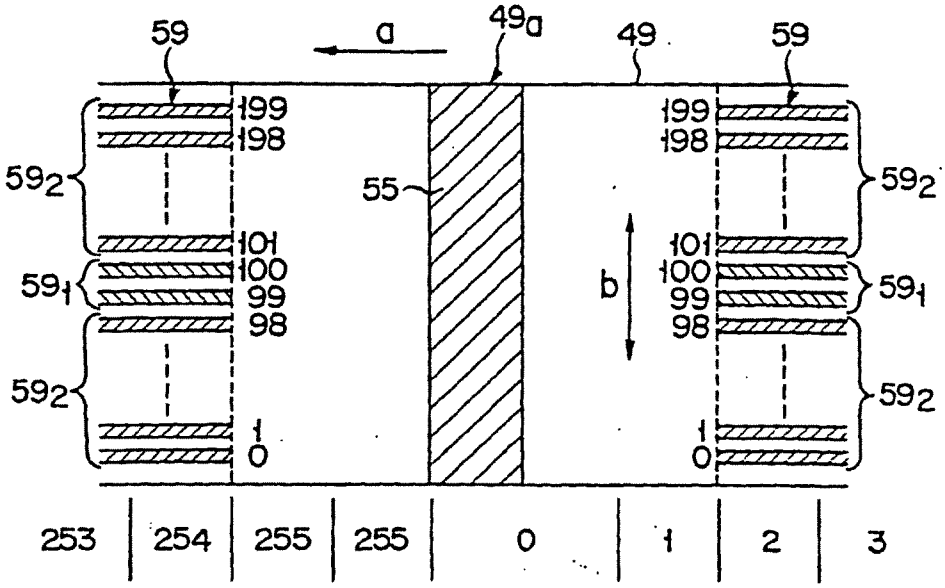


FIG. 6A

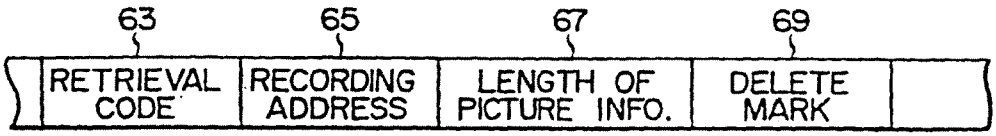
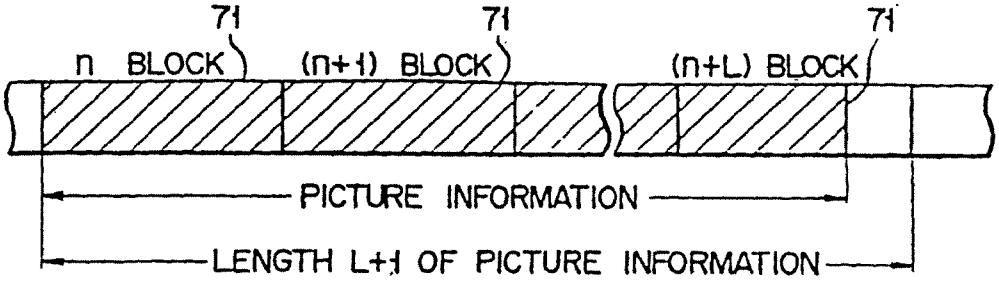


FIG. 6B



5/11

FIG. 7A

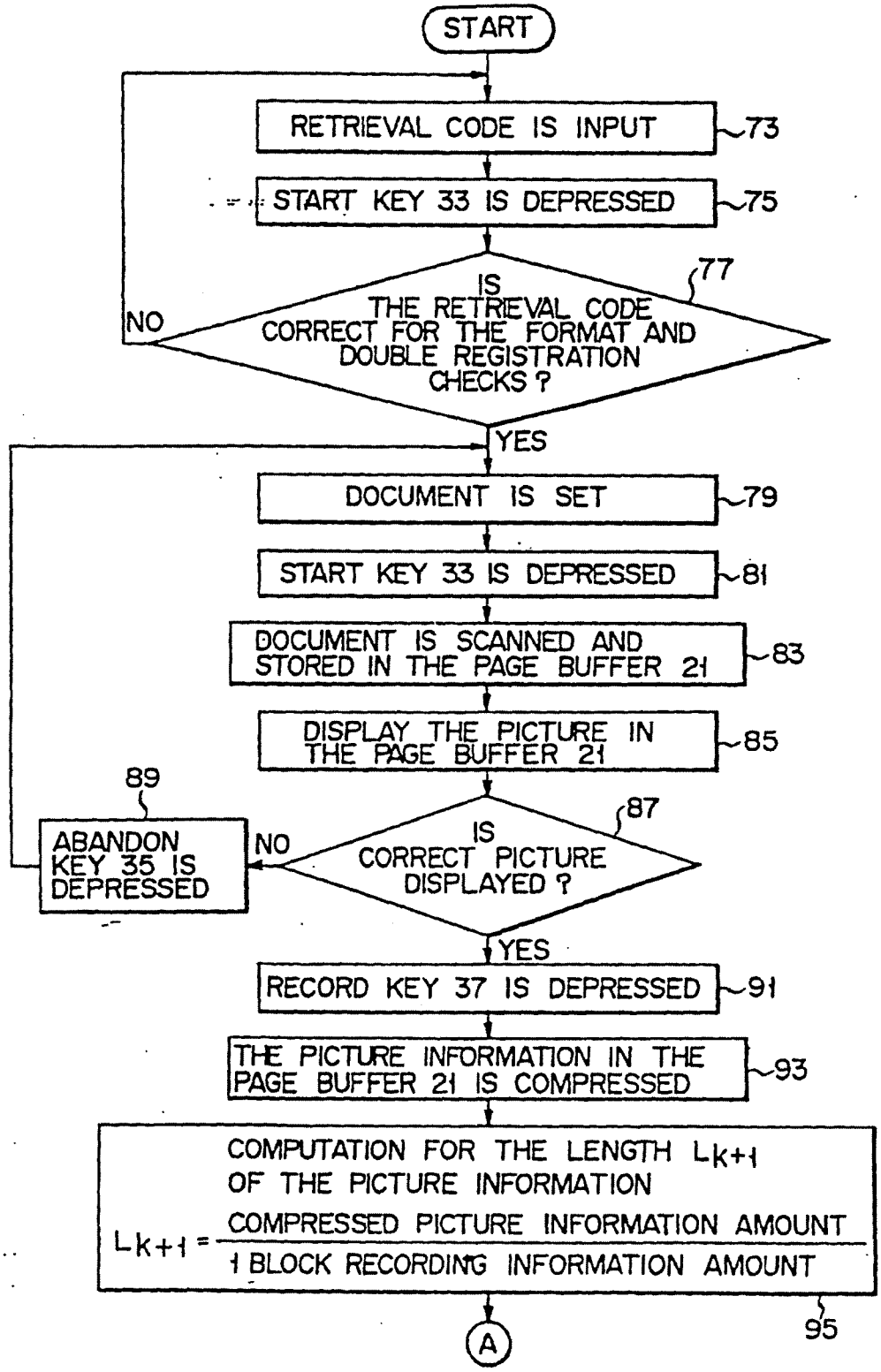


FIG. 7B

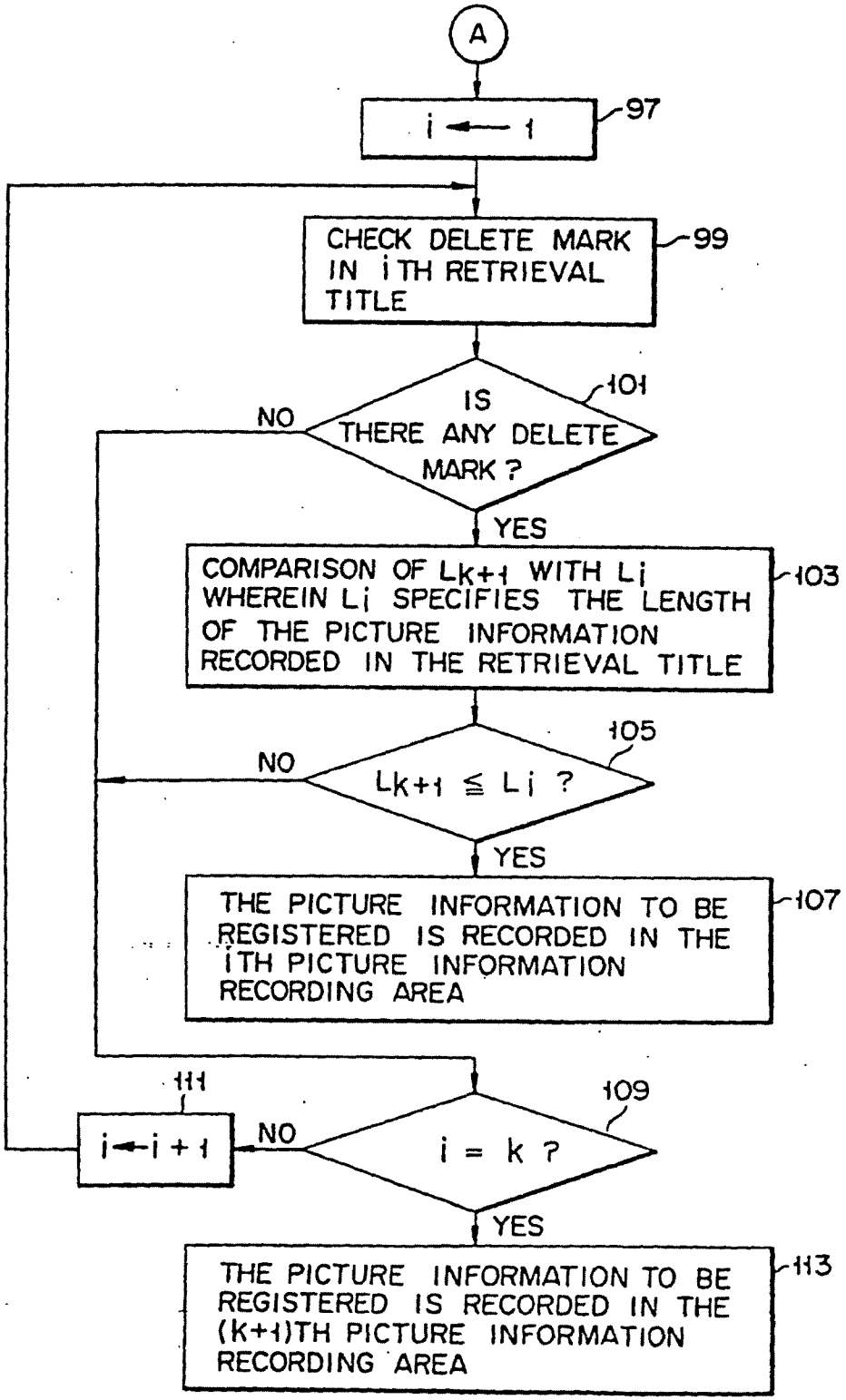


FIG. 8

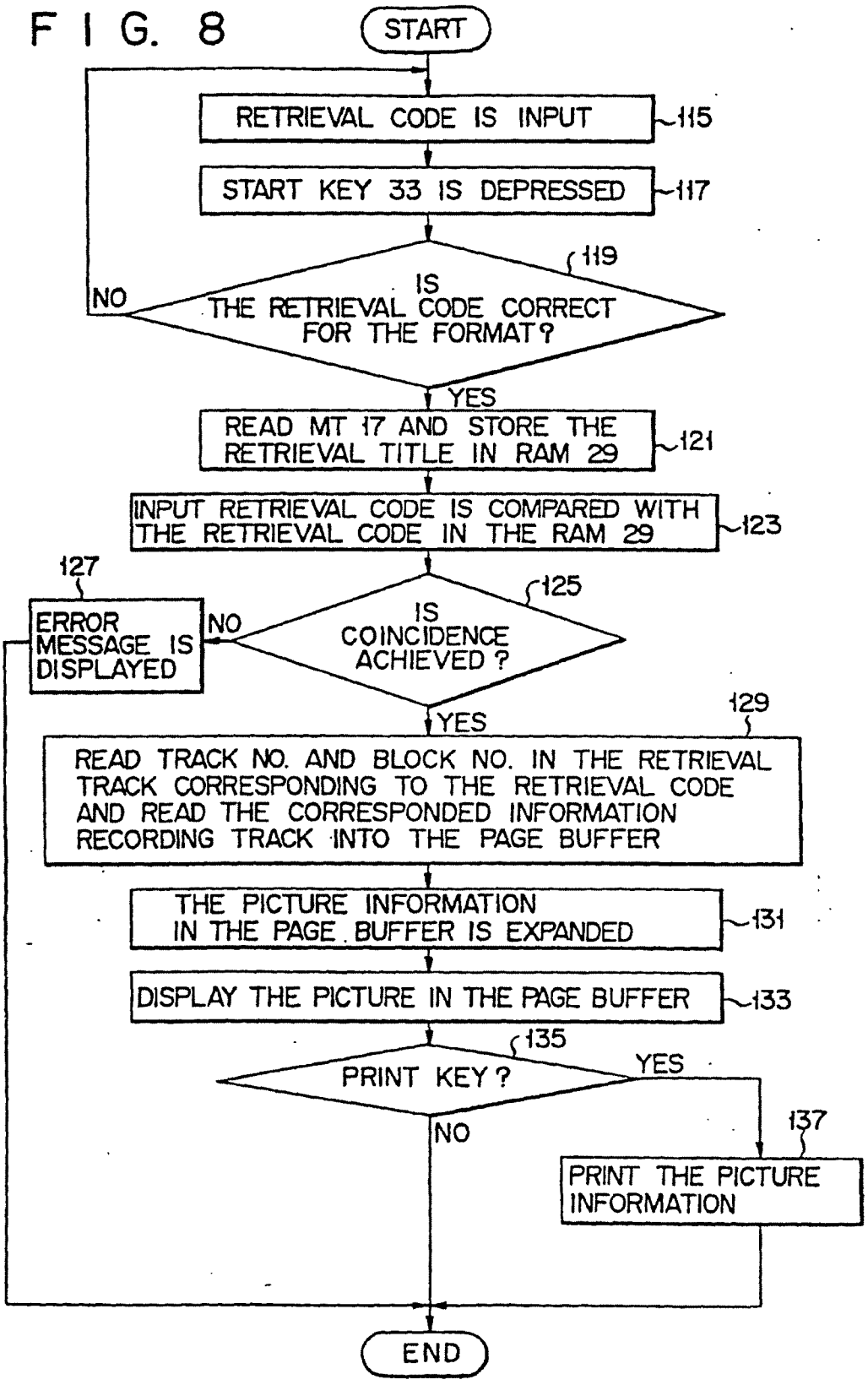

START
RETRIEVAL CODE IS INPUT
115
START KEY 33 IS DEPRESSED
117
119
IS THE RETRIEVAL CODE CORRECT FOR THE FORMAT?
NO
YES
READ MT 17 AND STORE THE RETRIEVAL TITLE IN RAM 29
121
INPUT RETRIEVAL CODE IS COMPARED WITH THE RETRIEVAL CODE IN THE RAM 29
123
125
IS COINCIDENCE ACHIEVED ?
NO
127
ERROR MESSAGE IS DISPLAYED
YES
129
READ TRACK NO. AND BLOCK NO. IN THE RETRIEVAL TRACK CORRESPONDING TO THE RETRIEVAL CODE AND READ THE CORRESPONDED INFORMATION RECORDING TRACK INTO THE PAGE BUFFER
THE PICTURE INFORMATION IN THE PAGE BUFFER IS EXPANDED
131
DISPLAY THE PICTURE IN THE PAGE BUFFER
133
135
PRINT KEY ?
YES
NO
137
PRINT THE PICTURE INFORMATION
END

FIG. 9

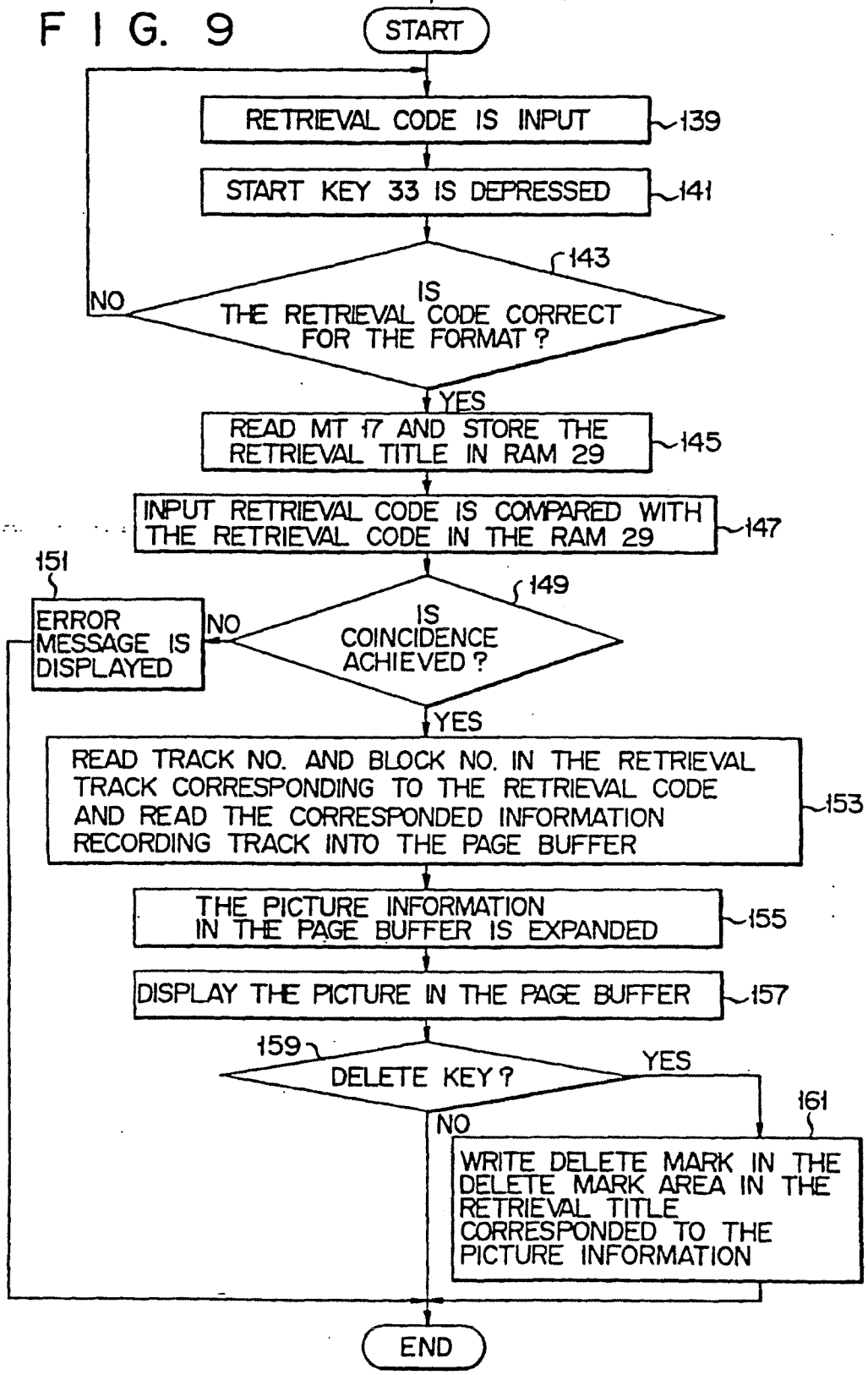

START
RETRIEVAL CODE IS INPUT
139
START KEY 33 IS DEPRESSED
141
143
IS THE RETRIEVAL CODE CORRECT FOR THE FORMAT ?
NO
YES
READ MT 17 AND STORE THE RETRIEVAL TITLE IN RAM 29
145
INPUT RETRIEVAL CODE IS COMPARED WITH THE RETRIEVAL CODE IN THE RAM 29
147
149
IS COINCIDENCE ACHIEVED ?
NO
151
ERROR MESSAGE IS DISPLAYED
YES
READ TRACK NO. AND BLOCK NO. IN THE RETRIEVAL TRACK CORRESPONDING TO THE RETRIEVAL CODE AND READ THE CORRESPONDED INFORMATION RECORDING TRACK INTO THE PAGE BUFFER
153
THE PICTURE INFORMATION IN THE PAGE BUFFER IS EXPANDED
155
DISPLAY THE PICTURE IN THE PAGE BUFFER
157
159
DELETE KEY ?
YES
NO
161
WRITE DELETE MARK IN THE DELETE MARK AREA IN THE RETRIEVAL TITLE CORRESPONDED TO THE PICTURE INFORMATION
END

FIG. 10

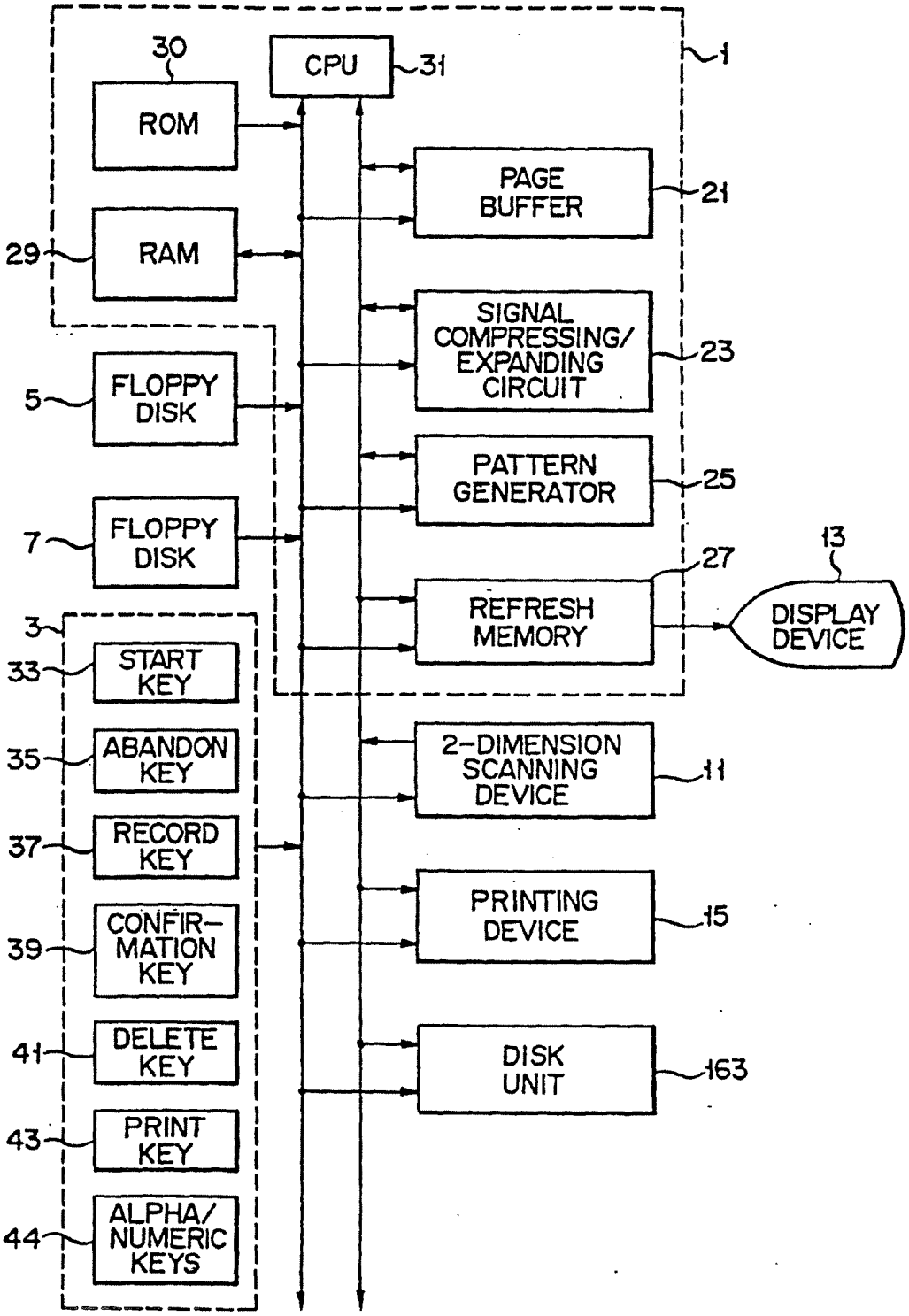


FIG. 11

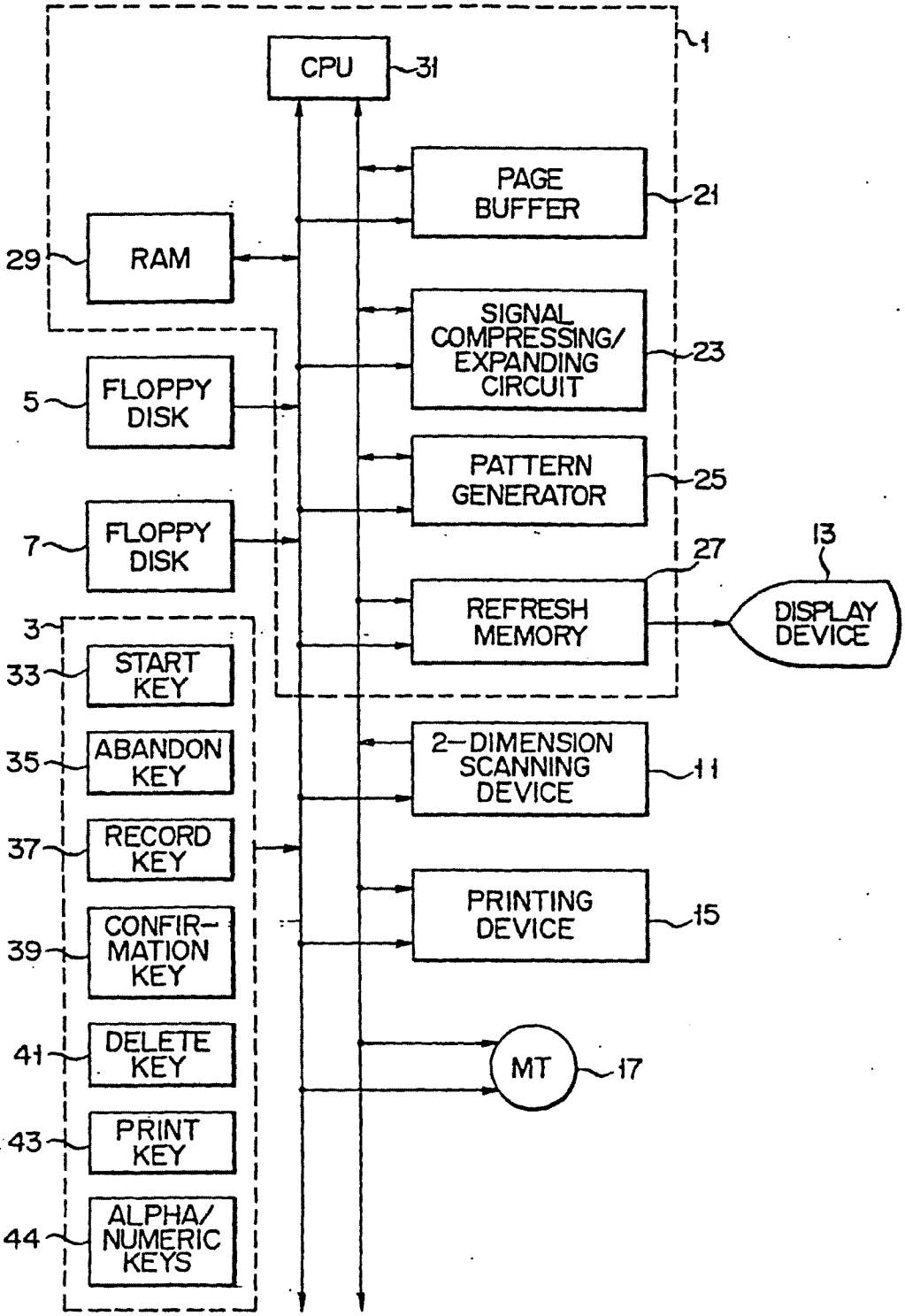
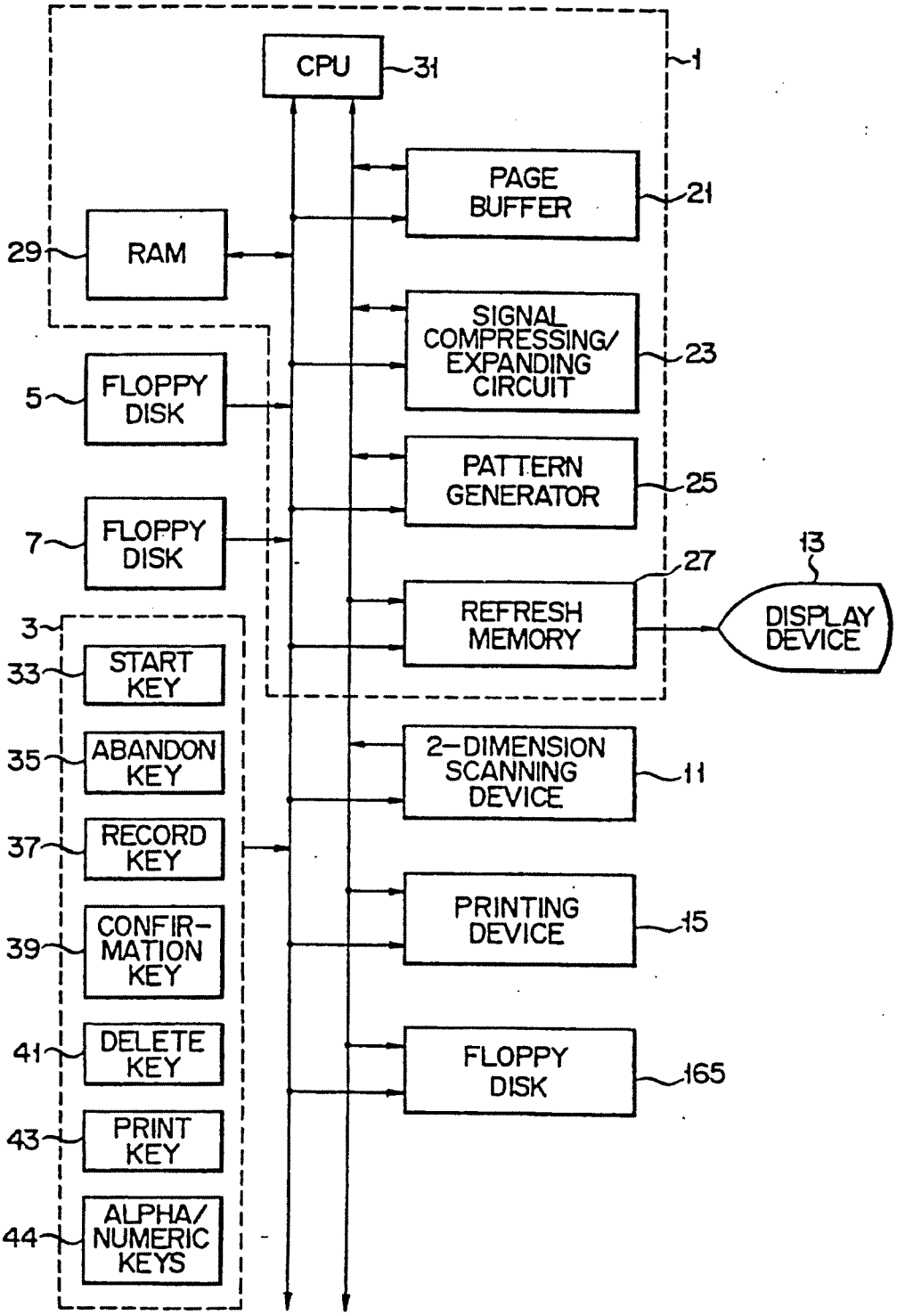

1
CPU
31
PAGE BUFFER
21
29
RAM
SIGNAL COMPRESSING/ EXPANDING CIRCUIT
23
5
FLOPPY DISK
PATTERN GENERATOR
25
7
FLOPPY DISK
27
13
REFRESH MEMORY
DISPLAY DEVICE
3
33
START KEY
35
ABANDON KEY
2-DIMENSION SCANNING DEVICE
11
37
RECORD KEY
PRINTING DEVICE
15
39
CONFIR-MATION KEY
41
DELETE KEY
MT
17
43
PRINT KEY
44
ALPHA/ NUMERIC KEYS

FIG. 12


CPU
31
1
PAGE BUFFER
21
29
RAM
SIGNAL COMPRESSING/ EXPANDING CIRCUIT
23
5
FLOPPY DISK
PATTERN GENERATOR
25
7
FLOPPY DISK
13
27
REFRESH MEMORY
DISPLAY DEVICE
3
33
START KEY
35
ABANDON KEY
2-DIMENSION SCANNING DEVICE
11
37
RECORD KEY
39
CONFIR-MATION KEY
PRINTING DEVICE
15
41
DELETE KEY
FLOPPY DISK
165
43
PRINT KEY
44
ALPHA/ NUMERIC KEYS

0051305

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 81 10 9408

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
A	US - A - 4 130 842 (GALLO et al.) * Whole document *	1-4
A	US - A - 3 512 146 (SMITH et al.) * Column 8, line 60 - column 12, line 15 *	1-4
A	US - A - 4 041 463 (SLUTZKY et al.) * Column 1, lines 27-31; column 3, line 49 - column 7, line 59 *	1-4
A	JOURNAL OF OPTICS, vol. 11, no. 1, January/February 1980, page 10 Paris, FR. "Système d'impression à laser" * Whole document *	1-4
A	PROCEEDINGS OF THE IEEE, vol. 68, no. 7, July 1980, pages 854-867 New York, U.S.A. R. HUNTER et al.: "International digital facsimile coding standards" * Whole document *	5
A	US - A - 3 646 260 (BOLGER) * Column 3, line 9 - column 5, line 23; column 5, line 65 - column 6, line 34 *	1-4

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CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)

G 11 B 27/02
5/008

TECHNICAL FIELDS SEARCHED (Int.Cl.³)

G 11 B 5/
19/
15/
27/
H 04 N
G 06 K
G 06 K 17/

CATEGORY OF CITED DOCUMENTS

X: particularly relevant if taken alone
Y: particularly relevant if combined with another document of the same category
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: earlier patent document, but published on, or after the filing date
D: document cited in the application
L: document cited for other reasons

&: member of the same patent family, corresponding document

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	08-02-1982	DAALMANS

EPO Form 1503.1 06.78

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 81 10 9408

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
PA	DE - A - 3 036 695 (TOKYO SHIBAURA DENKI K.K.) * Page 7, line 22 - page 17, line 19; figures 4-8 *	1-6
L	* Priority *	
	--	
A	FR - A - 2 120 298 (COMPAGNIE GENERALE DE CONSTRUCTIONS TELEPHONIQUES) & DE - A - 2 164 230	
A	FR - A - 2 170 510 (I.B.M.) & GB - A - 1 382 598	
A	FR - A - 2 079 793 (SOCIETE D'ETUDES ET D'APPLICATIONS TECHNIQUES S.E.A.T.)	

CLASSIFICATION OF THE APPLICATION (Int. Cl.³)

TECHNICAL FIELDS SEARCHED (Int. Cl.³)

EPO Form 1503.2 06.78

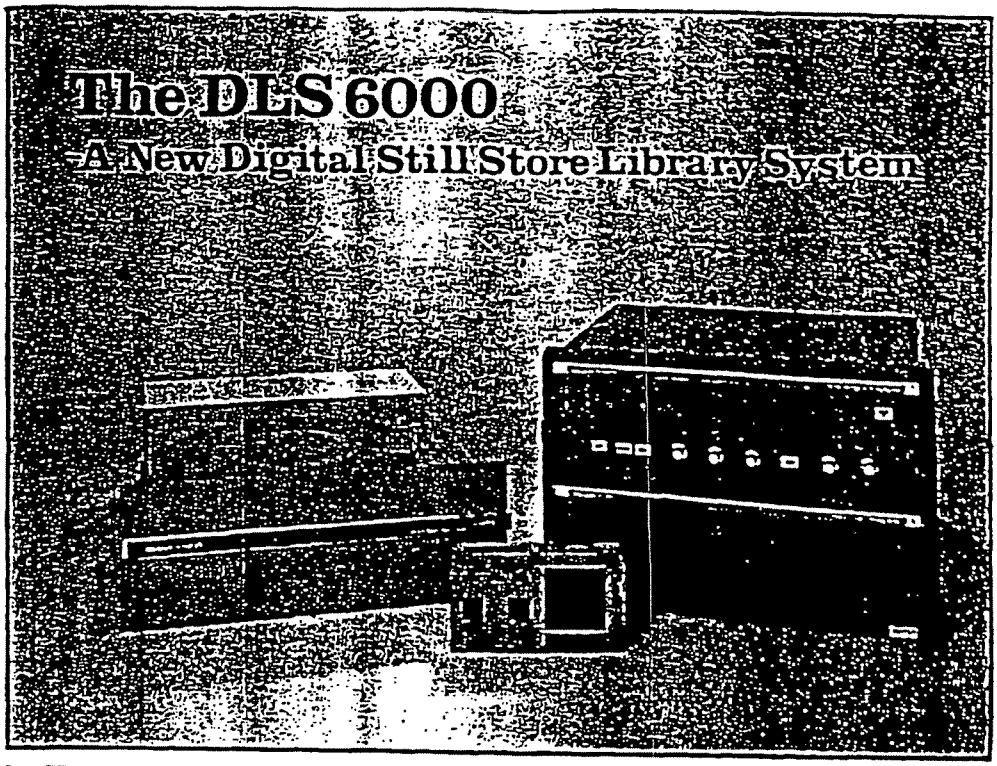
TAB G

360 - 5.1

S0466 0079

The DLS 6000

A New Digital Still Store Library System



by Hugh Boyd, Quantel.

The Quantel DLS 6000 Digital Library System was first introduced to broadcasters at private demonstrations held during last year's NAB and Montreux exhibitions. At that time, the product was still under development, and Quantel were seeking comments from their invited guests as to the final configuration of the DLS 6000. The proferred advice was considered sufficiently valuable by Quantel engineers for some of it to be included in the ultimate system design, which will be demonstrated publicly for the first time at NAB 1980.

The DLS 6000 represents a new generation of still stores for television broadcasting. The system provides not only significant improvements in basic performance over existing techniques, it also offers several unique facilities that make the unit a complete production tool. At only 10.5 inches high for the DLS 6000, and 7 inches high for the storage disc unit, the system is ideally suited for OB van use as well as in the studio.

The Digital Library System is a naturally evolutionary product to come from the Quantel stable. It is revolutionary in concept and is based on a solidly engineered, flexible piece of hardware utilising three framestores and a DEC LSI-11 minicomputer. Typically, the DLS 6000 embodies

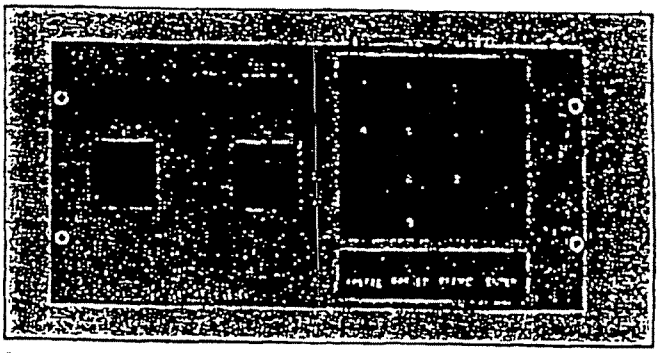


Figure 1. The DLS 6000 Control Panel

Quantel's basic principle of expandability by retrofitting new options as they become available. The word "obsolete" does not exist in the Quantel vocabulary!

Infinite Storage Capacity

The disc unit has a picture capacity of up to 340 stills. With multiple disc operation, say ten discs, 3400 pictures would be randomly accessible. However, the number of discs allowed is wisely unlimited, but is is anticipated that broadcasters requiring very large library storage will avail themselves of a video tape back-up store — a unique feature of the DLS 6000. Because the data is transferred in digital form, there is no loss of quality. Picture information can be transferred automatically from disc to a standard video cassette or reel-to-reel machine without it being modified, whether it is in use in a studio or OB van.

Transfers from tape to disc work in exactly the same way, therefore a cassette is all that is required to move information between locations. Similarly, a full archival store library can be formed from cassette or tape with more than 3000 pictures being stored on one tape. Again, being digital in format, no generation losses are seen no matter how many times the information is recorded or re-recorded.

USC 35 - 128 XR. 360 - 35

Production Effects Capability

The provision of a number of production effects seems to be a logical facility for a Quantel framestore-based product. The DLS 6000 has this integral feature for very practical reasons.

Picture repositioning is achieved by the simple movement of a joystick on the compact 8" x 4" control panel (Figure 1).

Picture compression is also achieved by moving a joystick. The stored image may be reduced to any size between normal (full frame) and virtually zero size. This feature, when used with repositioning, defines the exact size and position of a still without employing any other digital effects system.

Picture enlargement. Joystick movement enlarges the image up to two times to allow selection of a chosen portion of a still.

Variable aspect ratio. The aspect ratio of the image can be varied from the normal 4 x 3 to any rectangular shape.

Multiple picture handling. The DLS 6000 is capable of reproducing as many pictures as are wanted at the same time. This facility is clearly an adjunct to compression and repositioning. It is used either to show, at the same time, a number of participants in a discussion or event, or even to build up a complete montage of images. The pictures can be called down from the disc one at a time to show the viewer the build up, or can be called simultaneously so that only the finished composite is broadcast.

Borders. The DLS 6000 is equipped with its own border generator capable of changes in hue, saturation, luminance and width. Borders can be placed around all pictures being shown if desired, although different images can have quite different border parameters at the same time. The border generator also includes a background or matte generator, further releasing the mixer for other functions.

Extensive Operating Features

Both the technical director and the system operator were kept very much in mind by Quantel when designing the Digital Library System. Each has a computer display panel, with the director's being associated with the mixer and almost always used for replay. Whereas, the panel the operator (or "composer") uses, will be essentially employed for recording. The DLS 6000 is capable of single or two person operation, so two control panels may access the machine simultaneously for *time sharing*.

High change rate. Pictures can be changed at a rate of two per second with complete random access. Thus, no cache memory of the day's programme requirement has to be prepared.

On-air picture change. Although the change rate is limited to two per second, the additional framestore circuitry in the DLS 6000 allows vertical interval switching between pictures. The switch is instantaneous: only the throughput rate is limited to two per second.

On-air transitions. When using the DLS 6000, a mix/effect bus can be eliminated by utilising the digital transitions available in the unit. Changes between one picture and the next can be by means of a simple cut, a programmable dissolve, or even a wipe.

Multiple outputs. Three outputs are available with the DLS 6000 — two programme and one preview. Internally generated transitions are possible with both programme outputs, or they can be used together to utilise more exotic wipes in a mixer. Keys are generated by the system to match the picture at all times.

Preview. The DLS 6000 has its own preview output which can be operated without affecting the on-air programme or transitions. The preview allows the varying sizes or positions of images to be chosen by means of cross wires controlled by joysticks, and also contains the fast viewing or "browse" feature.

Browse. The preview facility has the ability to look through the contents of the disc by displaying 25 images at a time, and slowly moving them down the screen. This rolling list of pictures allows easy viewing to find a desired frame, or alternatively, permits the showing of pre-chosen slides waiting in the "stack" for display during a programme.

On-air editing. As previously mentioned, the on-air display or transition is unaffected by previewing. Similarly, the DLS 6000 permits the capture and recording of incoming material while the equipment is being used during a broadcast. This is an essential feature to get the full benefit of the system in a news studio situation.

Asynchronous operation. The input of the Digital Library System can handle asynchronous information to allow stills to be captured from incoming ENG material.

Graphics handling. The DLS 6000 is capable of keying stored graphics over displayed images, thereby releasing the mixer from this function. Graphics may have their size and position defined quite independently of picture information, always assuring perfect readability for all sizes of titled images.

Digital re-recording of composite pictures. Composite pictures created on the preview monitor can either be stored as control parameters to ensure recall on demand on the programme outputs, or alternatively, can be re-recorded back onto disc as a complete new picture at an individual location.

Editing system. Complete sequences of commands to the DLS 6000 can be set up and stored for simple single button operation during a programme. The editing system does, however, allow simple addition or deletion of items to ensure ease of operation in a fast moving news broadcast. The minicomputer in the system will permit the addition of standard computer peripherals at a later date to accommodate even more powerful editing equipment.

Control delegation. As previously stated, the control of the DLS 6000 can be time-shared between several stations including during a live broadcast. Separate preparation and replay panels permit the technical director to remain divorced from the recording of stills from incoming ENG material.

Obviously, the basic task of the Digital Library System is to replay the correct picture from the disc store. However, the usefulness of the system is greatly enhanced by the ability to choose the size and position of the replayed picture, and to define it in accordance with the requirements of the rest of a production. The Quantel tradition of high fidelity is maintained in the quality of the images produced by the DLS 6000 at all times, whether the size of the still has been modified or not. At all sizes and shapes, the unit displays excellent image quality, with-

GROUP 123

SLIDE	PICTURE	SIZE & POSITION	BORDER	TRANSITION	CUE
0	23	NORMAL	ON	DISSOLVE	20
1	18	COMPRESS	OFF	CUT	
2	14	ENLARGE		WIPE	10
3					
4	36	COMPRESS		SUPER	INSTANT
5	100	COMPRESS		SUPER	
6	23	COMPRESS		CUT	
7					
8	11	NORMAL		CUT	EXT
9	10				

NEXT GROUP 130

Figure 2. An example of a typical Edit Display (as would appear on the TV monitor).

out showing any hint that the video has been processed.

The Control System

The philosophy behind the control system for the Digital Library System is based on the concept of Pictures, Slides and Groups. A Picture is defined as an image on disc and has a number allocated to it at the time of recording. Pictures are normally recorded on disc at full size to give maximum flexibility on replay. A Slide is a Picture on replay that has the parameters of size, position, transition type and time, etc, allocated to it. The number of a Slide need not be the same as the number of the Picture that the Slide depicts. A Group is a collection of up to ten Slides.

It is essential to appreciate that, with this machine, defining a still merely by a number is insufficient due to the extra facilities available. Therefore, both the still and what is to be done with it must be defined before displaying on the programme output. The computer display. The extra degree of freedom made available by the DLS 6000 production features, make it necessary that at both preparation time and programme time, the operator always has a clear picture of exact machine status. In order to give the user this clear indication of the situation, a video display system has been added to the host computer, and it is via this display system that all setting of parameters is achieved.

The computer display output is added to the preview output, and hence, shares the preview screen. There are three types of computer display available to the user: Edit, Ident and Menu. A cursor display is added to all these to allow the size and shape of images to be defined on the preview monitor.

A Typical example of the Edit display is shown in Figure 2. It will be seen that the Slide number is independent of the Picture number as has been described earlier.

The Ident display overlays the true Picture number when using the "browse" feature, so that the various chosen Pictures may be easily identified.

The Menu display is a special option that allows selection of modes of use of the machine, and it is this display that is used in conjunction with the tape backing store system.

The recording chain is shown at the top of Figure 3. Input video enters the system and is immediately converted into digital format and passed to a framestore at full video data-rate. This input framestore acts as a freeze frame device and allows the user to select still pictures from the incoming live video. For simplicity, the link from the output of this store to the preview output from the DLS 6000 has not been shown, but in reality, the video follows this path allowing the user to observe the incoming picture at all times, whether live or frozen.

Once the chosen image has been frozen in the framestore it is read out from the store at disc rate via a data processor section to further reduce data rates, and then via the disc formatter to block the information suitable for writing onto the disc.

The disc itself is a latest generation Winchester drive high packing density sealed unit. The heads are of the flying type, but the construction of the disc eliminates the need to have expensive and unreliable head retraction mechanism — the heads actually land on the disc surface when the platter is not in motion. The disc data rate allows a picture to be generated in 0.5 seconds. The total package is highly reliable and rugged and includes parity check circuitry for optimum data integrity.

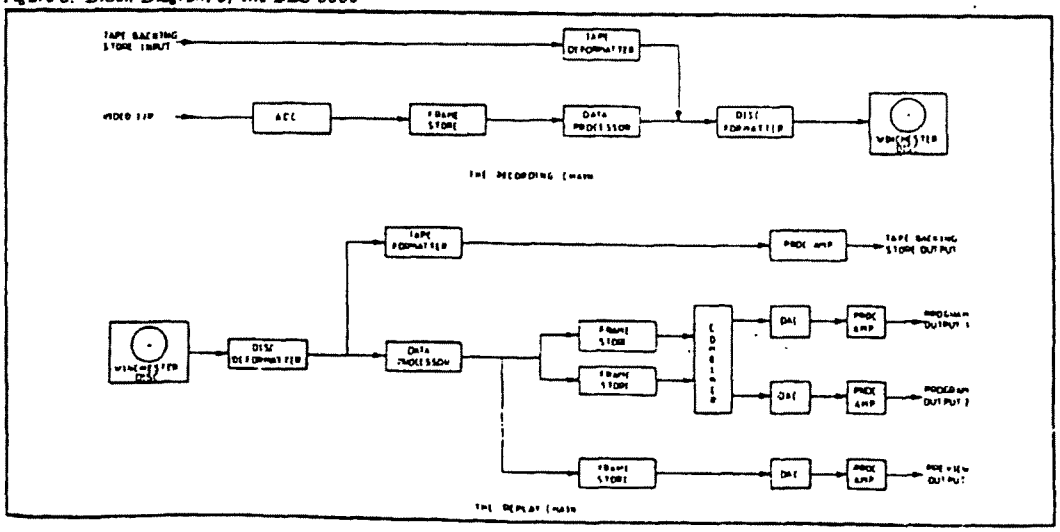
The replay chain, shown at the bottom of Figure 3, is obviously more complex than record due to the increased number of framestores and programme output facilitites. Data from the disc passes through a disc re-formatter where the information is sorted out from its blocks, and then onto the data processor where it is unpacked. At this point, the information is passed to one of the three framestores available, and it is now that the size change mechanism operates. If the information is routed via the preview store, no other processing is done other than reading it out of the store at full video rate into a DAC and onto the display via a proc amp. If the data is fed to one of the programme stores, it is subsequently passed to a digital combiner assembly that performs the appropriate wipe, cut or dissolve functions. Also, the combiner copes with the addition of borders or the keying of caption information over pictures or coloured matte.

For convenience, one framestore is shared between the video input facility and the preview output. Not shown in Figure 3 is the host DEC LSI-11 minicomputer that controls the whole machine and is responsible for all housekeeping tasks, the operation of the control panel and the editing system.

The tape backing store system is interfaced to the disc before and after the disc formatter and de-formatter. The information on disc has to be prepared and re-blocked by the tape formatter prior to the addition of syncs and burst for feeding to the tape system. It should be remembered that the tape system is perfectly conventional, and can be any recorder available in the studio or OB van.

When receiving information from the tape backing store, information is unpacked and blocked in a tape de-formatter before being passed on to the disc. The DLC 6000 Digital Library System is available in NTSC standard. But, as usual with Quantel, it is reasonable to assume that PAL and SECAM versions are already being developed. When they are introduced, one can expect even more flexible facilities to be unveiled, and naturally, none of them will make any other part of the existing system obsolete. ■

Figure 3. Block Diagram of the DLS 6000



been used with success for news broadcasts.

The ESS in Operation

A new graphic is prepared by a graphic artist, an example being the map in preparation as shown in Figure 4. Placed on the electronic graphics stand, the operator at the Master Access Station seen in Figure 3, by depressing a single button, causes the still to be recorded, and a display shows the disc pack in which it has been recorded and the particular track used.

Other stills to be used may be already recorded. By assigning access of the system to a conveniently located Remote Access Station, the producer or director may view any number of stills — a process of browsing through the archives — and select those which are to be used in the upcoming news broadcast. Each selected still is identified by a five-digit number given to the Master Access Station operator.

Next, a proposed sequence of plays is established and the operator now moves to record the stills in sequence on 64 tracks reserved for that purpose in each of the disc packs. The address of each still is entered on the keyboard and the system then effects the transfer of the still to its new position in the programme sequence tracks.

During the broadcast, a Remote Access Station is used in the programme control room. From here the operator calls up each sequential still by depressing a single button. The next two stills to be played are displayed on the control room monitors and are "taken" by the technical director as needed.

The ESS as a Production Tool

In addition to the use of graphics as an input, the ESS can 'grab' any required frame from a video signal and record it.

Independent video playback channels are provided for each of the disc drives. At the control room video switcher, or at the Master Access Station, these outputs may be superimposed, matted, or cross-faded. In this way composite stills may be built electronically.

"Splats" may be added to broadcast a composite picture. Thus, a map may be recorded in the ESS. The map is then recorded again, and a white "splat" superimposed by means of a transparent overlay. When the two slides are played back sequentially on air, the "splat" seems to appear instantaneously on the map.

Figure 3. Internal Access Station.

Figure 4. Graphics in preparation.

In all these production-building techniques, electronically-generated captions may be added to the composite picture as required.

When election results are being displayed and continually need to be updated, these graphic-building techniques are invaluable. As later election statistics become available, the new numbers are entered in place of the old ones and the new still is recorded and played to air.

A recent addition to this system is the slow motion feature. For this purpose two empty disc packs are loaded on the drives and can be used to record 1632 frames of sequential video — 54 seconds. This material, or any part of it, may be played back at any speed with a joystick control, even freezing a particular frame for a while if required. This playback may then be recorded on videotape for later broadcast.

Summary

CBS News in New York now has two ESS systems in operation, and some 11000 stills in the disc pack archives, serving the needs of seven different news programmes which together provide 15 hours of new broadcast each week. The creative possibilities of the ESS system will be used increasingly in other programming fields such as sporting events.

The Ampex ESS systems in operation at CBS have proven to be a powerful, efficient and fast acting production tool, giving new dimensions to the creativity and variety of graphic displays for television. ■

The Ampex ESS-2, System Outline

The ESS-2 is an advanced digital recording system that stores thousands of images. By using computer type disc recording techniques the system offers variable record and playback speeds and provides control of video action in forward or reverse while maintaining a broadcast standard picture. It eliminates the need for cumbersome and inefficient files of 35mm slides and graphics.

The production system is accessible through the keyboard controls at the electronics rack or at up to eight remote locations. Each panel is equipped with a keyboard and an alphanumeric readout. Access time from any station is less than 70 milliseconds, worst case.

The ESS-2 is offered in one, two or three drive formats. A single drive system allows storage of up to 814 stills or up to 27 seconds of real-time recording (or a combination of the two). The addition of a second disc drive creates even greater storage while a triple drive installation can hold up to 2442 stills or 81 seconds of real-time video action. Total on and off-line image capacity, using up to 98 disc packs, is 79,772 stills.

Action sequences and still images are recorded in colour or monochrome and stored in the memory with addresses consisting of the channel number, disc pack number and track number. There are 815 tracks in each disc pack, 749 of which are dedicated to storage of action and images. The additional 66 are reserved for storage of sequence lists and internal functions.

By keying the correct address, segments or stills can be called up from the memory. In less than 70 milliseconds the image or sequence is on the monitor to permit rapid review and the update of the stored files at any time. Individual segments are called up from the memory and copied to a sequence list to assemble a programme. The material can then be played on command at a later date either manually or by the station's computer.

Once assembled in sequence, stills are switched during the vertical interval so that access time is virtually instantaneous. The programme remains as a list that can be played once or as many times as needed, edited, modified and then erased. The original material from which the sequence or programme was assembled remains in memory for as long as desired.

While it is unlikely that all access terminals will be in use simultaneously, adequate provision for access control is incorporated. Access priorities can be assigned in any manner desired, depending on the number and location of terminals and the operating requirements of the facility. A key operated lockout feature provides file protection by preventing inadvertent or unauthorised erasure of any stored material.

Readers should note that the ESS-2 is presently available in NTSC only.

CERTIFICATE OF SERVICE

I, Julia Heaney, hereby certify that on May 23, 2006, I caused to be electronically filed the foregoing with the Clerk of the Court using CM/ECF, which will send notification of such filing(s) to the following:

Paul M. Lukoff, Esquire
David E. Brand, Esquire
Prickett, Jones & Elliott, P.A.

and that I caused copies to be served upon the following in the manner indicated:

BY E-MAIL on 5/23/06 and
BY HAND on 5/24/06

Paul M. Lukoff, Esquire
Prickett, Jones, Elliott, P.A.
1310 King Street
Wilmington, DE 19899

BY E-MAIL on 5/23/06 and
BY FEDERAL EXPRESS on 5/24/06

Michael J. Summersgill, Esquire
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Boston, MA 02109

/s/ Julia Heaney
Julia Heaney (#3052)